Name _____ Date _____ Class Period _____

Activity A

5.4 Investigating Graphs of Equations in Standard Form

MATERIALS	• graph paper • straightedge
QUESTION	When are two linear equations written in standard form equivalent?
EXPLORE	Graphing using the x- and y-intercepts

STEP 1 Find the x-intercept

Find the x-intercept of $3x + 2y = 6$ by substituting 0 for y and solving for x. Record the coordinate of the x-intercept in the table.

STEP 2 Find the y-intercept

Find the y-intercept of $3x + 2y = 6$ by substituting 0 for x and solving for y. Record the coordinate of the y-intercept in the table.

STEP 3 Graph

On your graph paper plot the intercepts. Draw the line through the two intercepts using your straightedge.

STEP 4 Repeat

Repeat Steps 1–3 for each equation in the table.

Equation	Coordinate of the x-intercept	Coordinate of the y-intercept
1. $3x + 2y = 6$		
2. $8x - 2y = 8$		
3. $3x - 4y = -12$		
4. $-4x + y = -4$		
5. $-6x + 8y = 24$		
6. $6x + 4y = 12$		

DRAW CONCLUSIONS Use your observations to complete these exercise

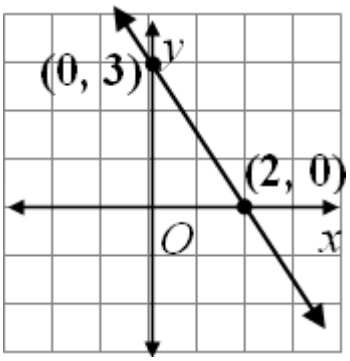
1. Were any of the lines that you graphed in the Explore the same? Which ones?
2. How are equations 1 and 6 related?
3. Compare the equations of those graphs that were the same.
4. Complete the statement: If one equation is a _____ of another, their graphs are the same.
5. Write two equations in standard form that are equivalent to $4x - 8y = 24$.

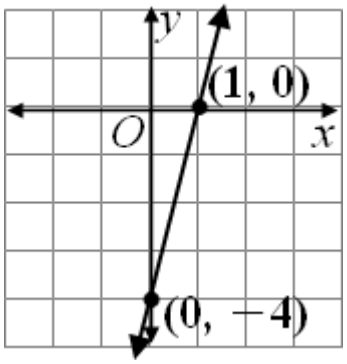
Answer Key A

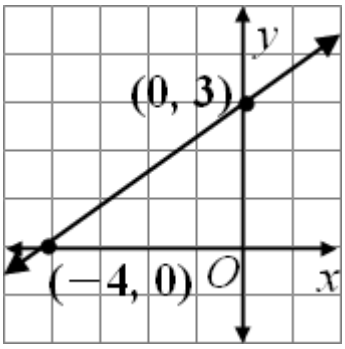
EXPLORE

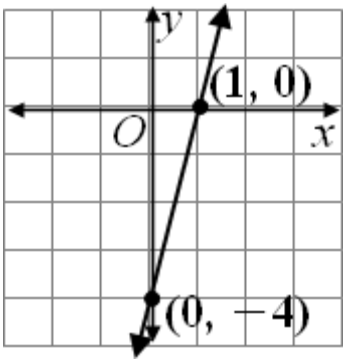
Equation	Coordinate of the *x*-intercept	Coordinate of the *y*-intercept
1. $3x + 2y = 6$	(2, 0)	(0, 3)
2. $8x - 2y = 8$	(1, 0)	(0, –4)
3. $3x - 4y = -12$	(–4, 0)	(0, 3)
4. $-4x + y = -4$	(1, 0)	(0, –4)
5. $-6x + 8y = 24$	(–4, 0)	(0, 3)
6. $6x + 4y = 12$	(2, 0)	(0. 3)

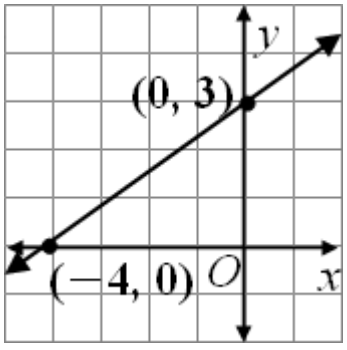
STEP 3

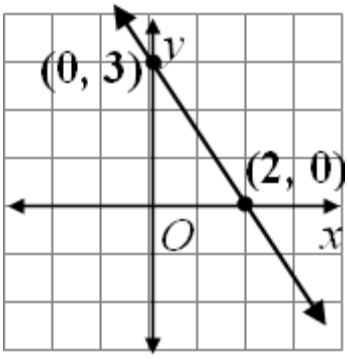
1. 

2. 

3. 

4. 

5. 

6. 

DRAW CONCLUSIONS

1. Yes; equations 1 and 6; equations 2 and 4; equations 3 and 5.
2. Equation 6 is two times equation 1.
3. One equation is a multiple of the other; there is a common factor that could be divided out.
4. multiple
5. If one equation is a multiple of another, their graphs are the same.
6. Answers may vary. Sample answer: $x - 2y = 6$ and $2x - 4y = 12$.

Teacher Notes

ACTIVITY PREPARATION AND MATERIALS

- Any size graph paper can be used for this activity.
- This activity can be done individually or in pairs. Decide how you will divide the class.

ACTIVITY MANAGEMENT

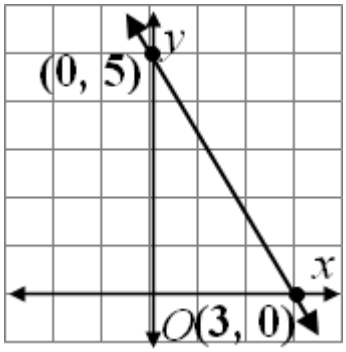
- The goal of this activity is to review graphing equations in standard form by determining their intercepts. In addition, students recognize that when one equation is a multiple of another, the graphs will be the same.
- Begin by asking students if they remember a quick way to graph a line written in Standard Form. Review finding intercepts. At this point students should be ready to work individually or with a partner to explore the first six equations. Equations 1–3 are all unique. As students start to work on Equations 4–6, they slowly start to recognize that these are "repeats" of the three previous problems. Students may or may not recognize that one equation is a multiple of another, but they see that the intercepts are the same as those they found previously and so the graphs are the same.
- When students finish the exploration, have students work together on the Draw Conclusions section. Exercises 1–3 generally do not present a big challenge to students, especially if there was discussion about these same observations while they were graphing.

Activity and Closure Questions

Ask these questions as a class.

1. Graph $5x + 3y = 15$

   Answer:



2. How do you find the x- and y-intercepts of an equation written in standard form?

   Answer: To find the x-intercept substitute 0 for y and solve for x. To find the y-intercept substitute 0 for x and solve for y.

3. How many equations can be written that are equivalent to $2x + 3y = 6$? *Explain*.

   Answer: An infinite number of equations that are equivalent to $2x + 3y = 6$ can be written. Any multiple of the equation will be equivalent.

LESSON TRANSITION

In this activity students review graphing lines in standard form by finding the x- and y-intercepts. After completing this activity students should understand that if one equation is the multiple of another the graphs will be the same. You should be able to begin the lesson with Example 2 on page 311.